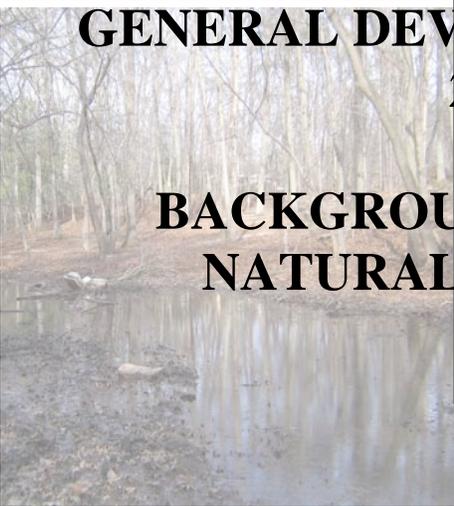
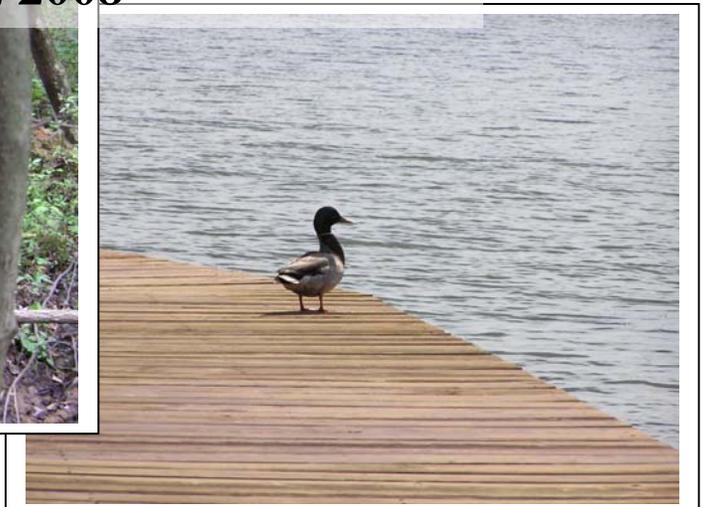


**ANNE ARUNDEL COUNTY
GENERAL DEVELOPMENT PLAN
2008**

**BACKGROUND REPORT on
NATURAL RESOURCES**



APRIL 2008



I. Introduction

The natural environment within Anne Arundel County is rich in diversity and is one of its biggest assets. The County has many large and small rivers, streams and coves that form over 533 miles of shoreline including the Chesapeake Bay, extensive woodlands, farmlands and sensitive areas such as tidal and nontidal wetlands, bogs and steep slopes. It is also home to a variety of animal and plant species.

Preservation of these natural resources is a high priority to the citizens of the County. The County's Office of Planning and Zoning has done an extensive amount of public outreach over the past several years in conjunction with its community-based Small Area Planning process. One of the most commonly voiced concerns throughout was the need for increased protection and preservation of the County's water, forest and other natural resources. There are multiple programs, plans, and regulatory measures in place at both the State and local level for protection of natural resources, and collectively they have accomplished much in terms of natural resource conservation. Still, there are areas in need of enhanced protection, restoration, or additional incentives to promote conservation.

Anne Arundel County has established several key goals for natural resource conservation through its various plans including the General Development Plan, the Small Area Plans, the Greenways Master Plan, Watershed Management Plans, and the Land Preservation, Parks and Recreation Plan. These goals and policies are consistent with the State's goals and include:

1. Protecting and preserving the Chesapeake Bay and its tributaries;
2. Improving and protecting surface water quality in non-tidal streams and tidal waterways;
3. Promoting conservation of water resources and protection of aquifers and aquifer recharge areas;
4. Creating an inventory of, and preserving and protecting sensitive areas in accordance with the State Planning Act to achieve environmentally sensitive land use;
5. Preserving open space, particularly in wetlands, heavily wooded areas, steeply sloped areas and other environmentally sensitive areas, and protecting open space and greenways;
6. Developing and maintaining an ecological greenway network by preserving and linking areas of valuable natural resources, wildlife habitat, and sensitive areas;
7. Encouraging preservation of existing forest, particularly on publicly-owned lands;
8. Establishing a Patuxent River Greenway;
9. Improving public access to public lands and waters without disturbing wildlife habitat and sensitive areas; and
10. Promoting the prudent use of mineral resources for economic utilization while maintaining the quality of life for surrounding residents.

In 1992, the State passed the Maryland Economic Growth, Resource Protection and Planning Act (State Planning Act of 1992) to direct development to suitable areas, and to preserve and protect sensitive areas. Stewardship of the Chesapeake Bay and its watershed is the underlying theme. This law requires local jurisdictions to address sensitive areas in their General Development Plans. The Plan must address four environmentally sensitive areas that require protection: (1)

streams and their buffers, (2) 100-year floodplains, (3) habitats of threatened and endangered species, and (4) steep slopes. In the 1997 *General Development Plan* (GDP), the County incorporated nontidal and tidal wetlands as a fifth environmentally sensitive area element.

The 1997 *General Development Plan* (GDP) set a goal of identifying, preserving, and protecting sensitive areas in accordance with the State Planning Act of 1992 and achieving environmentally sensitive land use. Policies such as managing the impacts of development comprehensively on a watershed basis through integrated planning and review, protecting and enhancing designated Scenic Rivers, protecting streams through establishment of riparian buffers, reducing flood damage along rivers through protection and preservation of floodplains, protecting and preserving naturally occurring steep slopes, and encouraging development methods and regulations that protect valuable environmental resources were adopted.

To achieve the goals and policies, action statements were adopted and include completing watershed management plans for each of the County's twelve major watersheds, revising development regulations to require undisturbed buffers along upland streams, improving stormwater management practices to reduce stream erosion and sediment transport to tidal waterways, connecting fragmented woodlands through establishment of greenways, establishing a program for forest restoration, and enforcing floodplain regulations. In addition, the 16 Small Area Plans (SAPs) supported the GDP actions by addressing sensitive areas and adopted compatible goals of protecting and preserving the environment. Recommendations of the SAPs include identifying and inventorying natural resources, creating land trusts to protect and preserve sensitive areas, promoting restoration activities, designating stream and habitat buffers, and developing regulations to protect sensitive species and unique watersheds from development.

This background report addresses the natural resources of Anne Arundel County, including those designated by the State as sensitive areas. In addition, the report includes discussion of the Chesapeake Bay Critical Area, State water quality criteria and State designated Tier II waters, the Jabez Branch watershed, forest resources, open space and greenways, and mineral resources. This report also discusses noise and air quality – two subjects related to protecting the County's natural resources. Programs and regulations currently in place for natural resource preservation will be described along with the steps the County has taken since adoption of the 1997 GDP to address the above goals. Finally, this report will identify future needs with regard to natural resource conservation that can be addressed through new policies and recommendations in the 2008 GDP. It should be noted that the topic of water resource protection will be thoroughly discussed in a separate Background Report on Water Resources that will focus more specifically on pollutant sources to area waterways (e.g. treatment plants, septic systems, and stormwater runoff), their impact on water quality, and their relationship to land use planning.

II. The Chesapeake Bay and its Tributary Streams

The Chesapeake Bay is the largest estuary in the United States (US EPA, 2004) with a watershed area of over 64,000 square miles encompassing portions of New York, Delaware, Pennsylvania, Maryland, Virginia, West Virginia, and the District of Columbia. It is over 200 miles long and is fed by 48 major rivers and hundreds of smaller rivers and tributaries. The Bay provides an ideal

habitat for a broad diversity of animal and plant species, and is an important economic and recreational resource for the more than 15 million people who live in the watershed.

Anne Arundel County, on the western shore of the Chesapeake Bay, is bordered almost entirely by water. The Patapsco River serves as the County’s northern border; to the west is the Patuxent River; and to the east is the Chesapeake Bay. As a result of being almost surrounded by tidal and non-tidal waterways, Anne Arundel County has over 533 miles of shoreline.

Twelve distinct watersheds, as shown in Figure 1, make up the Anne Arundel County landform. Over 1,750 miles of nontidal streams flow from these watersheds into one of the County’s rivers and, ultimately, to the Chesapeake Bay. The miles of stream, and watershed areas, are depicted in Table 1 below. With the exception of the Patuxent and Little Patuxent Rivers, all of Anne Arundel County’s waterways originate within the County’s jurisdictional boundaries.

A watershed is an area of land that drains into a river, lake, or other body of water. Watersheds come in all shapes and sizes; and they can cross county, state, and national boundaries. No matter where you are, you are in a watershed.

Table 1
Anne Arundel County Watersheds

County Watershed Name	Watershed Area (acres)	Estimated Stream Miles
Nontidal Patapsco River Watershed	15,177	124
Tidal Patapsco River Watershed	30,071	95
Bodkin Creek Watershed	6,029	14
Magothy River Watershed	22,574	62
Severn River Watershed	44,353	152
South River Watershed	36,156	207
Rhode River Watershed	8,726	65
West River Watershed	7,933	25
Herring Bay Watershed	14,251	108
Little Patuxent River Watershed	27,898	165
Upper Patuxent River Watershed	22,479	304
Middle Patuxent River Watershed	29,476	463
Totals:	265,123	1,784

Recognizing the value of these aquatic resources, the 1997 GDP adopted a goal of protecting and preserving the Chesapeake Bay and its tributaries by effecting policies and actions such as implementing the Chesapeake Bay Program initiatives for local government involvement through participation in the State’s Tributary Strategy Teams for the Patapsco/Back, Lower Western Shore, and Patuxent River Watersheds. Today, the County is in its 12th year of tributary strategies team participation, working with each of the three tributary strategy teams on a regular basis. Development of a Statewide Tributary Strategy was completed in 2007 and County staff, through participating in the teams, is working to implement strategy components at the local level.

The 1997 GDP also included language to support development of watershed assessment and management plans, and implementation of projects to restore, enhance, and preserve these trust resources. The County has established a program through its Watershed and Ecosystems Services Division to develop comprehensive Watershed Assessment and Management Plans for the 12 major watersheds denoted in Figure 1. These plans set forth a holistic approach to resource assessment, restoration, and preservation. The plans include an analysis of baseline conditions and natural resources in the watershed, identification of existing and potential environmental concerns, and short- and long-term opportunities for water quality improvement. The planning process prioritizes watershed restoration and preservation initiatives and recommends actions to facilitate land use and infrastructure decisions that will restore and protect water resources. Watershed assessment and planning provides a link between watershed models and geographic information systems to provide interactive information on how changes in land use and land regulations, best management practices, and other watershed conditions affect water quality and resource habitat. To date, the County has completed watershed assessment and management plans for the Severn River and South River watersheds, and is nearing completion for the Upper Patuxent River watershed. Assessment of the Magothy River watershed was begun in early 2008. In 2009, the Nontidal Patapsco River watershed assessment and management plan will be initiated.

Streams and Their Buffers

As noted in an earlier discussion, there are over 1,750 miles of non-tidal streams in the County. Most of these streams are short, first- or second-order headwater streams that are slow moving with a very low gradient. To better understand the physical characteristics of these sensitive resources, it is helpful to understand the topography as well as the underlying geology of the County. Topographically, the County is characterized by rolling terrain with elevations ranging from 0 feet above sea level along the Chesapeake Bay to 300 feet above sea level in the northwest part of the County. Geologically, the majority of the County is underlain by a wedge of unconsolidated sediments (e.g., gravel, sands, silts, and clays). However, in the very northwestern portion of the County these sediments overlap the eastern Piedmont rock formation along an irregular line of contact known as the Fall Zone. Moving eastward, the rocky outcrops of the Piedmont quickly give way to the more dominant gravel, sands, silts, and clays characteristic of Maryland's Coastal Plain Physiographic Province (Maryland Geological Survey, 2007).

Within the County, stream channels generally have softer and more easily eroded bottoms comprised of the predominant sand, silt, and clays noted above. As the streams flow toward the Chesapeake Bay, they slow down and begin cutting more deeply into the landscape. Reflecting the surrounding topography and underlying geology, these streams are noted to have moderate to low slopes and somewhat steep valley walls (DNR 2005).

Stream buffers are important in controlling nutrient and sediment runoff, maintaining stream temperatures, and providing aquatic and wildlife habitat. A stream buffer is an undisturbed strip of natural vegetation contiguous with and parallel to the bank of a stream that functions to provide bank stabilization, to moderate water temperature, provide a degree of sediment and pollutant removal, provide groundwater storage/recharge for a stream and provide wildlife habitat, open space, or both.

Stream buffer evaluation, conducted during the comprehensive watershed assessment and planning process, indicates that the majority of streams within the Severn, South, and Upper Patuxent River watersheds have vegetated buffers of at least 50 feet in width. In most instances, these buffers are vegetated with multistory canopy (i.e., trees and shrubs) providing both wildlife habitat as well as stream bank stabilization and nonpoint source pollutant removal. Information on the width and condition of stream buffers throughout the rest of the County will be compiled as part of the on-going watershed assessment and planning process.

Observations of stream buffer width reduction or total absences of stream buffers are most often found in association with developed lands. Additionally, the headwaters of many nontidal streams found in the older and more densely developed areas of the County have been enclosed in pipes or confined to man-made concrete-lined channels. More often than not, these stream systems have no vegetated buffer. Moreover, these headwater systems usually drain land development that occurred prior to stormwater management requirements. Stormwater runoff, and nonpoint source pollution, is rapidly carried away from the paved portions of the land through these man-made conveyances. The runoff is eventually discharged to a downstream waterway via a culvert outfall. The result of the uncontrolled runoff and discharge is manifested as a degraded natural stream channel characterized by steep-sided and slumping banks, scour pools near the outfall, a stream bed characterized by headcuts, trash strewn throughout the reach, and increased sediment deposition. A more detailed discussion on stormwater runoff and nonpoint source pollution and the effects they have on streams will be discussed in the Background Report on Water Resources.

Many cities/jurisdictions across the United States are now looking at “daylighting” previously enclosed streams so they can begin to function as natural waterways. The benefits of daylighting are many and include reducing runoff velocities and preventing stream bank erosion; improving water quality by exposing water to air, sunlight, vegetation, and soil, all of which reduce nonpoint source pollution; creating aquatic and riparian habitat for fish and wildlife; providing recreational amenities; and creating or linking urban greenways.

Chesapeake Bay Critical Area

As early as the 1960s, there was a growing awareness that the water quality, habitat condition, and overall health of the Chesapeake Bay were declining as fast as the human population of the bay was increasing. A 1983 EPA study (*Chesapeake Bay: A Framework for Action*) concluded that a comprehensive and long-term strategy for addressing the Bay’s decline was needed.

In 1984, the Maryland General Assembly passed the Critical Area Act in response to concerns about the decline in quality and productivity of the Chesapeake Bay. Through this action, the General Assembly enacted a comprehensive resource protection program for the Bay and its tributaries. As originally envisioned, the Act would serve to promote more sensitive land development and minimize water quality and habitat degradation. The drafters of the legislation recognized that the land immediately surrounding the tidal waters and wetlands of the Bay had a great potential to affect those resources. Therefore, the Critical Area Act created a special planning area called the Critical Area, and identified this area as all land within 1000 feet of the mean high water line of tidal waters and/or within 1000 feet of the landward edge of tidal wetlands, and all waters of and lands under the Chesapeake Bay and its tributaries. The 1,000-

foot area was delineated using Maryland's 1972 State Wetland Maps. Local governments then transferred this "Critical Area Boundary" to their own maps.

The law also established a Statewide Critical Area Commission to oversee the development and implementation of local Critical Area programs. The Commission developed specific criteria to guide local jurisdictions in developing these programs. In 1986, the Maryland General Assembly approved the Critical Area Criteria established through the Critical Area Commission work efforts. The result was implementation of local Critical Area Programs directed towards minimizing adverse water quality impacts, conserving plant and animal habitat, and addressing land use policies for development in the Critical Area. In April 2008, legislation was passed by the State that will require an update to the Critical Area boundaries using recently updated State mapping standards. The State's updated mapping standards are part of an ongoing project called 'iMap'. The iMap project seeks to incorporate updated mapping data to the overall State Base Map. These updated data include higher resolution aerial imagery and base elevation data collected along the Chesapeake Bay and its surrounding tributaries. Once notified by the State via the Critical Area Commission that the Statewide mapping project is complete, local jurisdictions such as Anne Arundel County, will 24 months to update their Critical Area Map using the Statewide Base Map.

Anne Arundel County reviews all subdivisions, rezoning, special exceptions, and variance applications pertaining to property located within the Critical Area for impacts on water quality and habitat. Further, the County adopted its Critical Area Program based on the criteria established by the State's Critical Area Commission in 1986. The three major goals of the program are:

1. Minimize adverse impacts on water quality,
2. Conserve fish, wildlife, and plant habitat, and
3. Establish land use policies for development in the Critical Area.

The State and County program criteria include the requirement to identify and protect wildlife and plant habitats of particular significance due to their uniqueness, rarity, or possible future diminution, and which are not already protected or addressed by other existing programs. These habitats are also known as Habitat Protection Areas and are set forth in Anne Arundel County Code Article 17, Title 8, Subtitle 04, and also defined and discussed in COMAR Title 27, Subtitle 01, Chapter 09.

Pursuant to Anne Arundel County Code (Article 17, Title 8, Subtitle 5), Habitat Protection Areas are to be preserved and protected in connection with all development as required by the County and in accordance with the recommendation of the Maryland Department of Natural Resources and other review agencies. Designated Habitat Protection Areas (HPAs) include:

1. Minimum 100 foot buffer from tidal wetlands and waterways,
2. Nontidal wetlands,
3. Threatened and endangered species and species in need of conservation,
4. Colonial water bird nesting sites,
5. Historic waterfowl staging and concentration areas,

6. Existing riparian buffers,
7. Forest areas used by forest interior dwelling birds,
8. Anadromous fish spawning areas, and
9. Natural Heritage Areas and other areas of local significance.

A key provision of the County's Critical Area Program is the establishment, protection, and maintenance of the minimum 100-foot wide vegetated Critical Area buffer. This buffer, a designated HPA, is geographically located within the Critical Area, and encompasses lands within 100 feet of mean high tide or the edge of tidal wetlands and tributary streams. The Critical Area buffer is a naturally vegetated and forested area, or an area established in vegetation and managed to protect aquatic, wetlands, shoreline, and terrestrial habitat from man-made disturbances. The areal extent of the buffer is expanded when steep slopes, hydric soils, or highly erodible soils exist contiguous to the 100-foot buffer. No clearing or disturbance is permitted within the buffer without prior approval of the County.

The Critical Area within Anne Arundel County comprises about 49,000 acres of the County (See Figure 2). As directed by the State criteria, the County's Critical Area Program designated three categories of land development within the Critical Area. Designations were based on existing development and public services available as of December 1, 1985. The three designations are: Intense Development Area (IDA), Limited Development Area (LDA), and Resource Conservation Area (RCA). The IDA category was applied to those lands where existing or adjoining uses were predominantly higher density residential, commercial or industrial. The LDA category was applied to moderately developed lands, and the RCA designation applied to primarily undeveloped or low density developed lands. Grading, building, and land use must follow the Critical Area criteria specific to that designation. These criteria are summarized below and more fully described in the County's Land Use Ordinances.

1. IDAs can be developed with medium to high-density housing, commercial, or industrial uses, according to the underlying zoning designation. Pollutant loadings must be reduced by 10% and Habitat Protection Areas (HPA) must be protected. A minimum 100-foot stream buffer is required.
2. LDAs can be developed with low to medium density housing (a maximum of less than 4 units per acre), commercial and small industrial uses according to the underlying zoning designation.
3. RCAs are limited to one dwelling unit per 20 acres, agricultural and forest uses, and resource utilization according to the permitted use list.

Development within the LDA and RCA must limit impervious surfaces to 15% - 31% of the site. Additionally, the minimum 100-foot buffer must be maintained, and other HPAs are protected. Forest clearing is limited and when allowed, must be replaced. Developments on unforested sites are required to establish 15% of the site in forest.

Within the Critical Area, the County can grant a change in a property's land use classification through the growth allocation process. In accordance with State law, 5 percent of the County's designated RCA classification may be used for growth allocation. In 2003 the law was changed to limit the use of growth allocation to commercial properties only. In order to receive growth

allocation, the applicant must meet the Critical Area Criteria for development in the new designation as well as the criteria for the Growth Allocation process.

State Antidegradation Policy and Tier II Waters

Maryland’s water quality standards consist of three components that, together, set goals to protect the State’s water quality. The components are:

1. Designated Uses for each water body (e.g., recreational use, potable water supply);
2. Criteria that set minimum conditions to support the designated use (e.g., dissolved oxygen concentration not less than 5 mg/l at any time); and
3. Antidegradation Policy that recognizes three tiers of water quality and establishes a way to maintain high quality waters such that they are not allowed to degrade to meet only the minimum criteria for their designated use.

Nationally, the Antidegradation Policy was first recognized in the 1987 Clean Water Act Amendments. Subsequent to those amendments, Maryland Department of the Environment (MDE) adopted the Antidegradation Policy as part of the State’s Water Quality Standards. Maryland’s Antidegradation Policy was promulgated in COMAR 26.08.02.04.

The regulatory intent of Maryland’s Antidegradation Policy is to protect the existing designated uses, and the water quality necessary to support those uses, by providing a means for assessing activities that may lower the quality of our State’s high quality waters. For purposes of implementing this policy, waters of the State are categorized into one of three tiers based on their assessed water quality and biological conditions. Tier I waters are those that meet the minimum criteria to support their designated uses. Tier II “high quality” waters are those water bodies where existing conditions are better than the minimum required for their designated use. Tier III Outstanding National Resource Waters (ONRWs) are those water bodies of exceptional quality, where the most stringent protection is both necessary and appropriate to protect and maintain the resource.

Anne Arundel County contains two Tier II stream segments, both located on Lyons Creek in the southern portion of the County. A map of the Tier II stream segments is found in Figure 3. The Lyons Creek stream segments are designated High Quality Tier II waters due to exceptional aquatic biological community conditions (fish and aquatic benthic macroinvertebrates) from within the stream. As can be seen from Table 2, the first segment of Lyons Creek was listed as a Tier II water in 2003; the second was listed in 2007.

Table 2
Tier II Waters in Anne Arundel County

Date Listed	Stream Name	Watershed	Baseline	
			Fish IBI*	Benthic IBI*
2003	Lyons Creek 1	Patuxent	5.00	4.71
2007	Lyons Creek 2	Patuxent	4.67	5.00

* IBI = Index of Biotic Integrity

A stream segment is eligible for Tier II classification based on water quality and biocriteria. When the water quality of a stream segment is better than that required by the water quality standards to support designated and existing uses, the stream segment is listed as a Tier II water. All readily available water quality and biocriteria information may be considered to determine a Tier II listing. Tier II listings are made only for those specific characteristics for which monitoring data indicate the stream segment exceeds the numeric water quality criteria (e.g., high dissolved oxygen concentrations) or thresholds established under the narrative standards for biocriteria (e.g., high index of biotic integrity). MDE proposes stream segments to be designated Tier II waters during the triennial review of State water quality standards. This regulatory process occurs every three years, as required by the Federal Clean Water Act, and incorporates active public involvement. At the end of the review period, proposed Tier II waters are adopted via the promulgation of new State water quality standards.

New or proposed amendments to water and sewer plans, and new discharge permits or proposed changes to existing permits trigger an antidegradation review to assure consistency with antidegradation requirements. Specifically, COMAR 26.08.02.04-1B states that “An applicant for proposed amendments to County plans or discharge permits for discharge to Tier II waters that will result in a new, or an increased, annual discharge of pollutants and a potential impact to water quality, shall evaluate alternatives to eliminate or reduce discharges or impacts. If impacts are unavoidable, an applicant shall prepare and document a social and economic justification. The Department shall determine, through a public process, whether these discharges can be justified.” It should be noted that a Tier II Antidegradation Review does not apply to individual discharges of treated sanitary wastewater of less than 5000 gallons per day, if all of the existing and current designated uses continue to be met.

Ultimately, the existing Tier II instream designated water uses, and the level of water quality necessary to protect those uses, must be maintained and protected. MDE may deny any proposed discharge or plan amendment if the existing uses will not be maintained and protected.

Jabez Branch and Jabez Branch Overlay Zoning

Jabez Branch, a tributary to the Severn River (Figure 4), is unique among streams in Anne Arundel County in that it supports a naturally reproducing population of brook trout (*Salvelinus fontinalis*), the only population known to exist in the Coastal Plain physiographic region of Maryland. Because of the presence of this coldwater fishery, Jabez Branch is a Designated Use III water (a designation specific to use as a naturally reproducing trout stream) by the Maryland Department of the Environment, the only such designation by MDE in the Coastal Plain region.

First identified in this subwatershed by the Maryland Department of Natural Resources in 1977, it was originally believed that this species was only present in the reaches upstream of MD Route 32, hereafter referred to the Left and Right Forks. However, subsequent surveys in the 1980s show them occurring sporadically throughout the watershed to its confluence with Severn Run.

During 1987, a severe basin wide decline was observed in the population. Research work done by the Maryland DNR associated this decline with stormwater discharges linked to a retention basin installed as part of stormwater management activities implemented during construction of Interstate 97. The basin was unshaded and was designed to have standing water remain within it

for an extended time period to enhance pollution removal functions of the facility. However, by allowing the runoff to remain for an extended period of time as a permanent pool, the runoff was excessively warmed by the sun. When this runoff left the facility, it caused temperatures within Jabez to rise beyond the maximum temperature tolerated by this species (~68 degrees, Fahrenheit). The State Highways Administration corrected the discharge from this facility in the spring of 1988. However, the continued input of heated stormwater from other sources resulted in continued decline and eventual extirpation of the species from Jabez Branch by the end of 1990 (Yetman, 1991).

In mid-1991, DNR biologists began stocking wild brook trout into Jabez Branch in an effort to restore this fish back to the system. These efforts were maintained from 1991 to 1994, when a total of 328 adult fish from watersheds in Frederick and Baltimore Counties were released in the Jabez. This program was discontinued in 1995 when DNR biologists observed fry, indicative of successful reproduction. Since 1995, brook trout reproduction has been documented in Jabez Branch each year through 2007 by the Maryland Department of Natural Resources.

To protect this critical and rare resource, Victoria (2007) suggests that attention should focus on maintaining or achieving five conditions, including:

1. A stable, coldwater stream flow regime;
2. Minimizing or eliminating all fine sediment inputs;
3. Maintaining a diverse mix of instream habitat conditions like woody debris jams, and undercut banks. An approximate 1:1 ratio in the distribution of riffles and pools provides the best mix of bed features for this species
4. Keeping watershed wide effective impervious surface levels at current levels or reduce these levels where feasible, and
5. Protecting the large buffer areas, which generally vary from 100 to >300 feet, around all stream channels in this portion of the Jabez.

Protection of the Jabez Branch subwatershed, shown in Figure 4, is a priority environmental goal, and to this end the Odenton Small Area Plan recommends that the County establish an environmental overlay zone for the subwatershed. To realize this goal, and to achieve the above listed conditions and ensure continuation after realization, the County has been working with the Severn River Commission to develop requirements for an environmental overlay zone specific to this subwatershed.

In general, an environmental overlay zone applies additional restrictions, beyond those associated with the various zoning categories applicable to lands within the designated zone, to protect rare, unique, or otherwise important natural resources found within the County. The restrictions associated with the overlay zone apply only to those lands within it. For the Jabez

Brook Trout
(*Salvelinus fontinalis*)

The brook trout (*Salvelinus fontinalis*) is a member of the family Salmonidae, a large family of freshwater or anadromous fishes that includes salmon, charrs, trouts, graylings, and their allies. They are typically strong swimmers and many are commercially important food and/or game fishes. The species name for brook trout, *fontinalis*, means "living in springs," a reference to its tendency to be found in very small, spring-fed streams.



Branch, the overlay zone would serve to minimize the impacts from stormwater runoff and sediment loading to the stream, maintain or reduce existing impervious surfaces levels, maintain adequate stream flow and temperature to protect the coldwater temperature and flow regime, and establish and maintain wider forested riparian buffers than currently required under County stormwater management regulations to protect the overall ecosystem quality.

The final language of the overlay zone has not yet been determined. County staff and a subcommittee of the Severn River Commission are now finalizing the desired requirements of the zone and will continue to work with the Office of Planning and Zoning to develop appropriate regulatory language. Once adopted, regulations would then be incorporated into the County's Zoning Ordinance.

III. 100-year Floodplain

The 100-year floodplain is the land area adjoining a river or stream that has a 1% or greater probability of flooding in any given year. In general, a floodplain is a relatively flat or low land that is subject to partial or complete inundation from floodwater. Historically, 100-year floodplain protection requirements were used to guard against injury to people and to prevent destruction of property. In the context of sensitive areas protection, relatively undisturbed floodplains also serve a variety of environmental functions.

A floodplain is an integral part of the stream system. It provides storage capacity for high flows, helps reduce the erosive power of the stream during a flood, reduces the discharge of sediment during high flow periods and helps floodwaters to move downstream. Floodplains also offer opportunities for wildlife habitat that can increase the biotic diversity of a stream. Floodplains provide water quality benefits as well. It is vital that the 100-year floodplain be kept in its natural state to protect public safety and the quality of streams and their habitats.

Anne Arundel County is prone to three types of flooding: nontidal flooding from rivers and streams; tidal flooding from storm surges and tides; and coastal flooding caused by intense winds and heavy rains from tropical storms, hurricanes and steady on-shore winds and elevated tide levels. More about coastal flooding and coastal high-hazard flooding will be discussed in the background report on Sea-Level Rise.

Floodplains in the County are protected through the Floodplain Ordinance (Article 16), the Subdivision and Development Ordinance (Article 17) and the Zoning Ordinance (Article 18). See Figure 5 for a delineation of floodplains within the County. The Floodplain Ordinance defines the floodplain districts, requires delineation of the floodplain on development plans submitted to the County, requires structures to be elevated above the 100-year flood level and safe vehicle access to and egress from a development is provided. The Subdivision Ordinance requires subdivisions with floodplain areas that are not deeded to the County as open space to provide an easement for access to and maintenance of the floodplain. Most of the floodplain area in the County is zoned Open Space, which allows protection of the floodplain in its natural state. Additionally, the stream buffer requirements associated with stormwater management for new development also serve as a means of floodplain protection.

The Federal Emergency Management Agency (FEMA) is the Federal agency responsible for floodplain management. The floodplains are studied and delineated on official maps. Currently, FEMA is working in partnership with the Maryland Department of the Environment (MDE) to update floodplain studies and associated mapping for 17 Maryland counties including Anne Arundel. This effort, known as the Map Modernization Program, began in 2004 as a cooperative technical partnership between these State and Federal agencies.

The average age of the Flood Insurance Rate Maps (FIRMs) in Maryland is 18 years, and most of the floodplain studies were conducted in the late 1970s to mid 1980s. Given the changes in land uses since that time, many of the maps no longer depict current conditions from which the flood heights were determined. Additionally, most current flood maps are paper maps. The goal of this modernization project is to produce D-FIRMs (Digital Flood Insurance Rate Maps), or completely digital products that will allow different geographic information system layers to be overlain.

Through the Map Modernization Program, FEMA will prepare the Flood Insurance Study (FIS) report and map in a Countywide format, which means that flood hazard information for all jurisdictions of Anne Arundel County will be included in one FIS report and one set of DFIRMs. FEMA will include all essential information from FIRMs, Flood Boundary and Floodway Maps, or Flood Hazard Boundary Maps currently in effect. In addition to preparing the FIRM and FIS, a new photographic base map will be provided.

FEMA is preparing the new maps using a process that involves capturing data in a digital format and then plotting map panels using computer technology. Light Detecting and Ranging (LiDAR) technology that supports 2-foot contour mapping is being used for accurate coastal flood zone mapping. LiDAR also allows for more accurate hydrologic modeling and the use of automated hydrology and hydraulic techniques for the riverine floodplain analysis critical to the new floodplain studies. Overall, this technology will generate 100-year flood elevations, and better floodplain lines, to meet FEMA's and the County's needs.

Anne Arundel County's updated flood study is anticipated to reach conclusion in early 2009. Currently, the hydrology and hydraulic modeling is nearing completion and the State is in the process of finalizing both the study and the DFIRMs. Once complete, the studies and resultant DFIRMs will be available for review.

The ultimate objective of the FEMA map modernization project is to more accurately estimate the flooding risk to all County property. For the citizens of the County, this means not only a better estimation of flooding risk for their property, but a more accurate determination of the need for flood insurance from the National Flood Insurance Program (NFIP).

IV. Wetlands

Wetlands, as defined by the Maryland Department of the Environment, are areas that hold water for significant periods during the year and are characterized by anaerobic (low oxygen) conditions favoring the growth of specific plant species and the formation of specific soil types.

For resource management purposes, the U.S. Fish and Wildlife Service developed a scientifically based definition of wetlands that helped ensure accurate and consistent wetland determinations. This definition emphasizes three key attributes of wetlands: 1) hydrology – the degree of flooding or soil saturation, 2) wetland vegetation (hydrophytes), and 3) hydric soils. This further defines wetlands as all areas having enough water at some time during the year to stress plants and animals not adapted for life in water or saturated soils.

Wetlands are important natural resources providing numerous values to society, including fish and wildlife habitat, flood protection, erosion control and water quality preservation. Wetlands comprise a range of environments within interior and coastal regions of Maryland and include both tidal and nontidal wetlands.

Tidal Wetlands

The State of Maryland defines “Tidal Wetlands” as follows: "all State and private tidal wetlands, marshes, submerged aquatic vegetation, lands, and open water affected by the daily and periodic rise and fall of the tide within the Chesapeake Bay and its tributaries, the coastal bays adjacent to Maryland's coastal barrier islands, and the Atlantic Ocean to a distance of 3 miles offshore of the low water mark." (Tidal Wetlands Act; Natural Resources Article, Annotated Code of Maryland Regulations)

Anne Arundel County is fortunate to have with over 500 miles of tidal shoreline and large areas of tidal wetlands (See Figure 6). Tidal wetlands have long been recognized as an important component in the health of the Bay. They provide numerous environmental benefits such as filtering sediment and nutrients from upland runoff, controlling flooding and shoreline erosion, providing nurseries for shellfish and finfish, absorbing nutrients from the water column, and providing valuable habitat for many aquatic and terrestrial species of flora and fauna.

Tidal wetlands are critically important to commercial and recreational fisheries. Many of the Bay’s commercial fin and shellfish spend a crucial part of their early life cycle in tidal wetlands, and use these areas as refuge from predators.

The County protects tidal wetlands through implementation and enforcement of the Critical Area Program, discussed earlier in this report. Through the permitting process, any proposed impacts to tidal wetlands are assessed to determine compliance with Critical Area requirements, including the requirement for a 100-foot buffer to tidal wetlands. Additionally, the County coordinates with the U.S. Army Corps of Engineers and MDE to prevent adverse impacts to tidal wetlands from development projects and shoreline stabilization projects.

Nontidal Wetlands

The State of Maryland defines Nontidal Wetlands as areas meeting the following conditions: "(a) ...an area that is inundated or saturated by surface water or ground water at a frequency and duration sufficient to support, and that under normal circumstances does support, a prevalence of vegetation typically adapted for life in saturated soil conditions, commonly known as hydrophytic vegetation; (b) is determined according to the Federal Manual; (c) does not include tidal wetlands regulated under Natural Resources Article, Title 9, Annotated Code of Maryland." (Nontidal Wetlands Act; Natural Resources Article, Code of Maryland Regulations or COMAR).

On the Western Shore of Maryland's Coastal Plain, nontidal wetlands have more varied topography and are generally easier to delineate in comparison to wetlands on the Eastern Shore. These wetlands are often located near streams, although the prevalence of long-term overbank flooding is rare in these areas. Most Western Shore wetlands are supported by a localized, perched water table rather than by shallow groundwater.

Within Anne Arundel County, over half of all wetlands are considered upland or non-tidal wetlands. These are areas where water is the primary factor controlling the hydrology and associated plant life. There are many types of non-tidal wetlands such as forested wetlands, scrub-shrub wetlands, and wet meadows. Non-tidal wetlands provide many of the same environmental functions as tidal wetlands, including providing habitat for fish and wildlife, maintaining water quality and flood control, reducing nutrients from runoff, and recharging groundwater.

The County protects these areas through enforcement of the Chesapeake Bay Critical Area Program, the sensitive areas criteria of the County Grading Ordinance (Article 16 Title 2) and the County Subdivision Ordinance by requiring a 25-foot buffer around nontidal wetlands except in the Parole Growth Management Area, where it is set between 25-75 feet depending on quality and function of the wetland (Article 17 Title 6, Subtitle 4 and Title 7, Subtitle 9). In addition, Article 18, Title 11 of the County Code requires a 50-foot buffer to nontidal wetlands for sand, gravel and clay extraction. All permits that impact wetlands are required to obtain approval from the U.S. Army Corps of Engineers and MDE. See COMAR Title 26, Subtitle 23 Nontidal Wetlands and Subtitle 24 Tidal Wetlands for State regulations pertaining to wetlands.

Bogs

According to MDE, Nontidal Wetlands of Special State Concern are the best example of Maryland's nontidal wetland habitats and are designated for special protection under the State's nontidal wetland regulations. These 365 wetland sites have exceptional ecological and educational value and offer landowners opportunities to observe and safeguard the beauty and natural diversity of Maryland's best remaining wetlands. Many of these special wetlands contain populations of rare and endangered native plants and animals. Other nontidal wetlands of Special State concern represent examples of unique wetland types and collective habitats for species that thrive in specialized environments.

Examples of these special types of wetlands are bogs, Delmarva bays, and coniferous swamp forests. Bogs are highly acidic wetlands that lack the nutrients most common plants require to survive, therefore, they provide habitat for specific communities of plants and animals. Rare plants such as cranberries, Leatherleaf shrubs, sundew, and carnivorous pitcher plants grow on a mat of sphagnum moss, sedges, and peat. The Delmarva bays are depressions on the Eastern Shore that fill with water in the winter and spring, and dry in the late summer and fall. Because these environments are self-contained, they support many rare and unique species. Coniferous swamp forests are uncommon to Maryland and found in areas such as Garrett County.

Anne Arundel County has several bogs within the Magothy River Watershed, the Severn River Watershed and along the Tidal Patapsco River. Within the Magothy River Watershed, along the north shore of the river, these bogs include: South Gray's Creek Bog, North Gray's Creek Bog

Complex, Fresh Pond Bog, Main Creek Bog, Eagle Hill Bog, Shady Pond Bog, Blackhole Creek Bog and Cockey's Creek Bog. Along the south shore of the Magothy River watershed are the Dill Road Bog, Cypress Creek Bog and the Cypress Creek Atlantic White Cedar Forest. Bogs within the Severn River Watershed include the Deep Ditch Bog, Gumbottom Bog and Sullivan's Cove Atlantic White Cedar Forest. Along the Tidal Patapsco River, between Main Creek and Rock Creek is the Hines Pond Bog.

Anne Arundel County recognizes these unique systems as being worthy of preservation and protection. Article 18, Title 14 of the County Code sets forth the protective requirements via a Bog Overlay Zone. The bog protection area is divided into the following classifications: bog, contributing streams, 100-foot upland buffer, limited activity area and contributing drainage area. Additionally, Article 17 Title 9 of the County Code prohibits disturbance of any kind within a bog and the contributing streams. It further stipulates development requirements within the 100-foot upland buffer, the 300-foot limited activity area and the contributing drainage areas. Bog protection areas are shown in Figure 7.

V. Steep Slopes

Slopes provide an environment for movement of soil and pollutants during land disturbance. Soils have varying degrees of erodibility and all soils are subject to some degree of movement. Control of this movement, or erosion potential, is often achieved by focusing environmental regulations on those areas where the slope of the land is sufficiently steep to make soil movement a problem. These are considered "steep slopes".

The preservation of steep slopes adjacent to streams, wetlands, and tidal waters is particularly important because of the potential harm to water quality and aquatic habitat that would result from soil erosion. In addition to the loss of water quality and habitat, disturbance of steep slopes can lead to landslides, flooding, and other hazards.

Steep slopes are defined in the County Code (Article 17) as those that have a 25% or greater slope and that have an onsite and offsite contiguous area that is greater than 5,000 square feet over 10 feet vertical as measured before development. In the Critical Area and designated sensitive areas, steep slopes are defined those that having a 15% or greater slope.

Most of the steep slopes occur along the rivers and streams (See Figure 8). A nearly continuous stretch occurs between the headwaters of the Severn River to the County's southern boundary near Herring Bay. The most severe slopes are along the Severn and South rivers. It is imperative to protect these slopes from erosion, which can lead to poor water quality from the sediment loading into streams.

Anne Arundel County protects erosion of steep slopes through the Subdivision Ordinance. Development in the County may not occur within steep slopes or within 25 feet of the top of the steep slopes where the onsite and offsite contiguous area of the steep slopes is greater than 20,000 square feet unless development will facilitate stabilization of the slope or the disturbance is necessary to allow connection to a public utility. In the RCA and LDA overlay zones of the Chesapeake Bay Critical Area, development may not occur within slopes of 15% or greater

unless development will facilitate stabilization of the slope or the disturbance is necessary to allow connection to a public utility. In addition, steep slopes are considered a primary environmental feature within the Stormwater Practices and Procedures Manual. They must be documented as part of the development process.

VI. Habitats of Rare, Threatened and Endangered Species

The Endangered Species Act of 1973 was signed into law by Congress to encourage and establish state programs aimed at preserving rare, threatened, and endangered (RTE) plant and animal species throughout the Country. This legislation effectively authorized States such as Maryland to protect and enhance sensitive ecosystems, which sensitive species rely upon for survival.

In 1979, the State of Maryland established the Natural Heritage Areas Program (See Figure 9 for a depiction of these areas). Administered by the Maryland Department of Natural Resources (DNR), this program is responsible for identifying, ranking, protecting and managing RTE species throughout the State. In order to accomplish this, Maryland DNR restores degraded habitats, conducts field surveys, performs research, and continues public outreach and education efforts. Currently, there are three distinct areas designated as Natural Heritage Areas within Anne Arundel County. These areas, (Cypress Creek Swamp, Eagle Hill Bog, and the Upper Patuxent Marshes) encompass approximately 2,646 square acres of protected lands. Each of these areas contains one or more RTE species classified by DNR.

The Natural Heritage Areas Program has established review areas through the State. Whenever there are proposed development projects within these review areas, DNR will examine the proposal to ensure that they do not negatively affect sensitive plant and animal species within them. In select circumstances, the Program will cooperate with local non-profit organizations to acquire land that encompasses RTE species. As of December of 2007, DNR has identified 10 animal species and 58 plant species classified as endangered, threatened, or in need of conservation in Anne Arundel County.

The 1992 Maryland Economic Growth, Resource Protection and Planning Act mandates that local jurisdictions address specific sensitive areas when producing and/or updating their General Development Plans. Protecting rare, threatened, and endangered species is one of the topical areas requiring protection under the 1992 Planning Act, and is critical to preserving the diverse ecosystem within Anne Arundel County. The State Department of Natural Resources is the primary agency responsible for establishing criteria for the protection and preservation of RTE plant and animal species. The County defers to the recommendation of the State and federal agencies in establishing the appropriate buffers to these habitats.

VII. Greenways, Open Space and Forest Resources

Land Preservation is an important component of natural resource conservation. Land preservation refers to retaining land in its natural state and protecting it from development or other man-made impacts. The County addresses land preservation through the protection of

open space areas, the creation of a greenways network, and through its forest conservation programs.

Natural areas such as forests, greenways and open spaces provide many valuable environmental benefits such as flood control, soil erosion control, filtration and absorption of pollutants and wildlife habitat. They can also help to absorb greenhouse gases, and their cooling effect can reduce energy costs.

It should be noted that open space and greenways as they relate to recreation areas will be discussed in a separate background report on Community Services. Also, a separate background report on open space as it relates to agricultural preservation is available.

The Maryland Department of Planning (MDP) and the Forest Service division of DNR have set goals for protecting and conserving open space, greenways and woodlands. These goals include:

1. Identifying, protecting and restoring sensitive areas and other lands and waterways that support important natural resources and ecological functions;
2. Focusing conservation and restoration activities within the statewide green infrastructure;
3. Developing a more comprehensive inventory of natural resource lands and environmentally sensitive areas to assist in implementation;
4. Assessing the combined ability of State and County programs to expand the network of contiguous green infrastructure, protect critical terrestrial and aquatic habitats, biological communities and populations, manage watersheds to protect and conserve natural areas and support a productive forestland base and forest resource industry;
5. Establishing measurable objectives for natural resource conservation and combined State and local strategies to achieve them;
6. Preserving the cultural and economic value of natural resource lands;
7. Encouraging private and public economic activities to support long-term conservation objectives;
8. Restoring, managing and protecting Maryland's trees, forests, and forested ecosystems to sustain our natural resources;
9. Connecting people to the land, and
10. Maintaining efficient and effective operations of forestry services to stakeholder groups through innovative technology, proactive policy communication / implementation, efficient use of resources, and professional development of personnel.

According to the Maryland Department of Natural Resources (DNR), Maryland has only two million acres of ecologically significant land that has not been consumed by sprawl development. Of these two million acres of "green infrastructure," almost three-quarters are unprotected and vulnerable to further reduction and fragmentation.

This has led to the enactment by the State of several effective funding mechanisms and land conservation programs and plans over the past several years to implement forest resource conservation goals and policies. These include:

1. *Program Open Space* – designed to acquire outdoor recreation and open space areas for public use, administers funds made available to local communities for open and recreational space through the State real estate transfer tax and from the Land and Water Conservation Fund of the National Park Service.
2. *Rural Legacy Program* – created within the Department of Natural Resources to protect natural, cultural, agricultural, forest and environmental resources from urban sprawl development and promote land conservation statewide by helping local governments and land trusts conserve land through easement and fee purchases within designated rural legacy areas.
3. *Patuxent River Policy Plan* – a land management strategy to protect the Patuxent River and its watershed. The Plan includes 20 goals that provide a broad vision to restore and maintain water quality, habitat, groundwater and surface water supplies, and a high quality of life along the Patuxent River and its tributaries.
4. *Maryland Environmental Trust* – comprised of four main programs that promote conservation of open space: Conservation Easements, Keep Maryland Beautiful, Local Land Trust Assistance, and Rural Historic Village Protection.
5. *Forest Legacy Program* – designed to identify and protect environmentally important forestlands through the use of perpetual conservation easements between willing sellers and willing buyers.
6. *Forest Conservation Act of 1991* – minimizes the loss of Maryland's forest resources during land development by making the identification and protection of forests and other sensitive areas an integral part of the development process. Areas that are a priority for conserving are those adjacent to streams or wetlands, those on steep slopes or erodible soils or those within or adjacent to large contiguous blocks of forest or wildlife corridors. Although the Maryland DNR Forest Service administers the FCA, it is implemented on a local level.
7. *Forest Land Incentive Program* – encourages long-term sustainability of non-industrial private forestlands by providing financial, technical, and educational assistance via State Forest Service Agencies to assist private landowners in actively managing their land.
8. *Greenprint* – a new program designed to protect lands critical to long-term ecological health. These lands, referred to as Maryland's green infrastructure, provide the natural foundation needed to support a diverse plant and animal population, and enable valuable natural processes like filtering water and cleaning the air, to take place. The new program is expected to boost the State's land conservation capacity by about 10,000 acres per year for the next five years. The funding allocated through this program expands the pool of money available for state land acquisitions. GreenPrint is targeted to protecting the most valuable remaining ecological lands in Maryland. A focused, strategic and sustained conservation initiative among state and local partners is needed to maintain biologically diverse landscapes.

Anne Arundel County participates in these State-sponsored programs and various County agencies are responsible for implementing them. The County has met the State requirements to participate and receive funding through the Program Open Space and Rural Legacy programs. The County Department of Recreation and Parks manages these programs and funds have been used to acquire lands for conservation purposes as well as for active recreation or agricultural preservation purposes. The County's Watershed and Ecosystem Services Division within the

Department of Public Works actively participates with the Patuxent River Commission to implement the Patuxent River Policy Plan. The County also has a Forest Conservation Program which is incorporated into the County Code and administered by the Department of Inspections and Permits and the Office of Planning and Zoning. In addition, the County has adopted master plans that provide tools for conserving natural resources and implementing a greenways network.

The County's *Greenways Master Plan* was adopted in 2002 with the goal of establishing an interconnected network of protected corridors of woodlands and open space that will protect ecologically valuable lands; provide open space, recreational and off-road transportation benefits for people; provide adequate habitat to support healthy populations of plant and animal species; and improve water and air quality within the County. Actions adopted for implementation of the greenways network include:

1. Establishing a Greenways Program within the County organization;
2. Creating a public involvement program and an advocacy committee;
3. Developing greenway implementation / management plans;
4. Prioritizing greenway target areas for protection;
5. Integrating the greenways network into the County's development review process;
6. Amending the County Code to strengthen protection of greenways;
7. Coordinating existing State and local programs such as the Forest Conservation Program, the Agricultural Land and Woodland District Programs and the Chesapeake Bay Critical Area Program to strengthen greenway protection;
8. Providing information to and educating the public on the benefits of land preservation programs; and
9. Creating an Anne Arundel County Greenways Fund, an Advanced Land Protection Revolving Fund and maximizing the use of existing programs to increase funding.

Figure 10 shows the County's greenways network covering approximately 71,700 acres, representing 27% of the total land area in the County. As of 2002, approximately 37,250 acres (51%) of this network were protected as one or more of the following: State, Federal, County and City of Annapolis owned lands, agricultural and environmental easements, private conservation lands and land in the County's OS zoning district.

The *Land Preservation, Parks and Recreation Plan (LPPRP)*, most recently updated in 2006, supports the State's planning visions and qualifies the County for State POS funds and other programs related to the Plan's objectives. The Plan supports the identified goals and designates three conservation areas for land preservation:

1. Areas designated for Rural land use on the County's adopted Land Use Plan, including the South County Rural Legacy area,
2. The County's open space zoning district, which is comprised of the 100-year floodplain, wetlands, parkland and other open space, and
3. The Resource Conservation Area designation of the Chesapeake Bay Critical Area.

According to the LPPRP, as of 2006 a total of 41,350 acres of natural resource land in the County has been protected from development through Federal, State, County or City of

Annapolis ownership, conservation easements, Open Space zoning and land trusts. When combined with State and County parkland and agricultural preservation land, the number increases to 61,670 acres, which represents approximately 23 percent of the total land area in the County. Major recommendations adopted in the LPPRP for natural resource land conservation include:

1. Consolidation of County natural resource goals and policies in the updated GDP,
2. Strengthening efforts of the 2002 Greenways Master Plan,
3. Exploring funding enhancements,
4. Completing watershed planning for the 12 major watersheds and strengthening the integration of the watershed management tool into land use planning, and
5. Continuing to increase opportunities for eco-tourism and resource based recreation.

In addition to the State programs that preserve open space, Anne Arundel County protects natural resources through regulations in the County Code. These include floodplain management, grading and sediment control, zoning and subdivision regulations. Furthermore, land is protected by five local land trusts that as a group form the Coalition of Anne Arundel County Land Trusts. Combined they have protected over 2,000 acres of land in the County.

One of the principal regulatory tools the County has to help implement some of the recommendations in these master plans is its Forest Conservation Program. The program was created in 1991 to meet the requirements of the Maryland Forest Conservation Act of 1991, which mandated that local governments adopt legislation to create a forest conservation program that met specific State requirements. The County's forest conservation requirements are incorporated in Article 17, Title 6, Subtitle 3 of the Development Regulations. In general, these requirements apply to new subdivision plans as well as applications for grading and sediment control permits on sites that are greater than 40,000 square feet. The subdivision plan or permit application must include a forest stand delineation and a forest conservation plan that:

1. Identifies, delineates and characterizes forested areas, specimen trees, floodplains, erodible soils, and other sensitive areas on the site,
2. Establishes forest retention areas or reforestation areas that meet a minimum conservation threshold, and
3. Protects these areas through forest conservation easements.

There are alternative approaches allowed for meeting the minimum threshold requirements, but the order of preference is as follows:

1. Retention of existing forest on the site, particularly in priority retention areas such as floodplains, stream or wetland buffers, or steep slopes,
2. Onsite afforestation or reforestation,
3. Offsite afforestation or reforestation,
4. Natural regeneration onsite or offsite, and
5. Payment of a fee-in-lieu to the County's Forest Conservation Fund. Money in this fund can be used for acquisition of forested areas for conservation, reforestation or afforestation costs, or program administration.

In addition to the regulatory requirements that developers must meet under this program, private landowners and community associations are encouraged to participate in reforestation projects with the County as well. Forest Conservation Fund monies can be used to reforest properties with native vegetation, and the landowner is required to place the reforested areas under a perpetual protective agreement such as a conservation easement.

Current estimates indicate that of the approximate 265,000 acres of land in the County, there are approximately 113,600 acres of woodlands, representing 43 percent of the total land cover. As seen in Figure 11, most of the larger contiguous areas of woodlands are in the central or southern portions of the County or along the Patuxent River. Although the County retains large amounts of forested areas, these areas have become increasingly fragmented over the past few decades as the County has experienced a moderately high rate of growth and development. More recent efforts at forest conservation are focusing not only on retention of woodlands but also on protection of larger interconnected networks of forest in order to maximize their benefits.

The goals, policies, programs and regulations that have been put in place for protection of sensitive areas, open space, greenways and woodlands have made critical strides in protection of the County's natural resources. Continued implementation of the recommendations from the comprehensive plans is key to continuing such efforts. Additional strategies are discussed at the end of this report. The remainder of this report focuses on the County's mineral resources and on noise reduction and air quality, which are essential to protecting the County's natural resources.

VIII. Air Quality

Air, like water, is a public resource that must be protected. Without appropriate air quality standards that are implemented, maintained and enforced, threats to public health and a decline in quality of life will result. Anne Arundel County suffers from air quality degradation caused, in part, by local topographic and meteorological conditions and exacerbated by urbanization.

The majority of air pollution in the region comes from three sources: mobile sources such as automobiles, trucks, trains, buses and construction equipment; area sources such as drycleaners, automobile body shops and consumer products such as paints and solvents; and stationary sources such as power plants, manufacturing and chemical industries and utilities. Approximately two-thirds of Maryland's air pollution originates outside of the State, and is primarily associated with the numerous power plants in the Ohio River Valley coupled with existing meteorological conditions. Although Maryland air quality has shown an overall improvement within the last two decades, air pollution continues to threaten public health and the environment.

Regulations and Programs

The United States Congress passed the *Clean Air Act (CAA)* and Clean Air Act Amendments, 1990, which address interstate movement of air pollution (transport pollution), international air pollution, permits, enforcement and deadlines. The CAA established primary and secondary standards for air pollutants to protect public health and the environment. *Primary standards* set limits to protect public health, including the health of "sensitive" populations such as asthmatics,

children, and the elderly.

Secondary standards set limits to protect public welfare, including protection against decreased visibility, damage to animals, crops, vegetation, and buildings. The CAA also established responsibilities for developing air quality regulations (Federal Government) and enforcing those regulations (delegated to the states).

The Environmental Protection Agency (EPA) Office of Air Quality Planning and Standards (OAQPS) has set National Ambient Air Quality Standards for six principal pollutants, which are called "criteria" pollutants. These pollutants are volatile organic compounds, sulfur dioxide (SO₂), particulate matter, lead, nitrogen oxides (NO_x), and carbon monoxide (CO). The CAA also regulates what are called "hazardous air pollutants" (HAPs). Chemical plants, dry cleaners, printing plants, and motor vehicles release HAPs. They can cause serious health and environmental effects.

The setting of maximum pollutant standards was coupled with directing the states to develop state implementation plans (SIP's) applicable to appropriate industrial sources in the state. An area that meets or exceeds the primary standard is called an attainment area; an area that does not meet the primary standard is called a non-attainment area.

The Baltimore region, which comprises Baltimore City and the surrounding counties of Baltimore, Carroll, Anne Arundel, Howard and Harford, continues to be designated a non-attainment area for exceeding the air quality standards for both 8-Hour ozone and fine particulate matter (PM_{2.5}).

The Maryland Department of the Environment (MDE) carries out mandates from the Federal Clean Air Act and administers air pollution monitoring, planning, and control programs to improve and maintain air quality. MDE has sites deployed across the state to measure ambient concentrations of these pollutants. The data are analyzed and form the basis of the SIP for meeting the NAAQS. Tightened controls on cars and trucks, reformulated gasoline, and the Maryland Vehicle Emissions Inspection Program have all helped reduce emissions from travel despite increases in congestion.

The emissions from nitrogen oxides (NO_x) and volatile organic compounds (VOC) are what contribute to Maryland's ground-level ozone problem and reduction of these emissions is key to improving air quality. Numerous studies and modeling data show that weather patterns often transport the pollutants well beyond the locality that produced the emissions. As much as 70% of air pollution comes from other states on Maryland's worst ozone pollution days. Emissions from cars in the Baltimore / Washington area is the significant cause of ground level ozone pollution of the short-range transport type. Nitrogen oxides are also a significant pollutant to the Chesapeake Bay. One-third of the nitrogen pollution entering the Bay is via atmospheric deposition.

Sulfur dioxide (SO₂) is the most important contributor to Maryland's fine particulate matter (PM_{2.5}) air pollution problem. Sources of SO₂ are burning of fossil fuels, including fuels used in vehicles containing sulfur compounds. Sulfur dioxide can be transformed into other products

such as fine particulate sulfates and sulfuric acid mist. Unlike coarse-mode particulate matter (PM₁₀) such as dust, pollen, and ash, PM_{2.5} are extremely small.

The Maryland *Healthy Air Act* was signed into law in April 2006 and became effective July 16, 2007. It charges MDE with implementing the primary goal of bringing Maryland into attainment with the NAAQS for ozone and PM_{2.5} by the federal deadline of 2010. It requires reductions in NO_x, SO₂, and mercury emissions from large coal burning power plants. It also significantly reduces atmospheric deposition of nitrogen to the Chesapeake Bay and other waters of the State. Based on significant analysis, MDE recently prepared a SIP that describes how the region will attain the 8-hour ozone standard by the designated attainment date of 2010 for the Baltimore region. MDE is currently in the process of developing an SIP for PM_{2.5}, which is also required to reach attainment levels by 2010.

Over 95 percent of the air pollution emitted from Maryland's power plants comes from the largest and oldest coal burning plants. Emission controls on power plants will reduce nitrogen entering the Bay by up to 900,000 pounds each year and will reduce mercury significantly. Power plant facilities within Anne Arundel County affected by the regulations are Constellation Energy Group's Brandon Shores and Wagner plants. The emission reductions from the Healthy Air Act come in two phases. The first phase, with a deadline of 2010, will reduce NO_x emissions by almost 70%, SO₂ emissions by 80%, and mercury emissions by 80% compared to the 2002 baseline. The second phase occurs in the 2012/ 2013 timeframe and will reduce NO_x emissions by approximately 75%, SO₂ emissions by approximately 85%, and mercury emissions will be reduced by 90% compared to the 2002 baseline.

The Healthy Air act also requires that Maryland become involved in the Regional Greenhouse Gas Initiative (RGGI) which is aimed at reducing greenhouse gas emissions. It is a cooperative effort by Maryland and other northeastern and mid-Atlantic states to reduce carbon dioxide emissions from electricity generating plants. RGGI is developing the first cap and trade program that is designed to reduce carbon dioxide, a greenhouse gas, while maintaining energy affordability and reliability. It is anticipated that carbon dioxide emissions from Maryland's electrical generators will be reduced by approximately 10 percent of current levels by 2019.

The Ozone Transport Commission (OTC) is a multi-state organization created under the Clean Air Act (CAA) and is responsible for advising EPA on transport pollution issues and for developing and implementing regional solutions to the ground-level ozone problem in the Northeast and Mid-Atlantic regions. The OTC has been working over the past several years to develop a regional power plant control program that is more aggressive than the federal approach.

Current County Goals and Strategies for Improving Air Quality

The 1997 General Development Plan established a goal to improve air quality and reduce toxic air pollutants. To meet this goal, it was determined that the County must work with other jurisdictions in the region to control detrimental impacts of air pollutants upon public health, property, environment, and climate. The goals and policies recently adopted in the County's 16 small area plans (SAPs) support the GDP by reiterating those of the GDP. The SAPs also state

goals that are more specific such as adopting proactive policies and measures to reduce air pollution and improve air quality, and developing land use plans that are less vehicle-dependent.

The County is a member of the Baltimore Metropolitan Council (BMC), the Baltimore Regional Transportation Board (BRTB), the Federally designated Metropolitan Planning Organization (MPO) for the Baltimore region and the Metropolitan Washington Council of Governments with the goal of creating regional strategies, plans and programs that will improve air quality. The BRTB adopted Transportation Outlook 2035 in November 2007. It is the long-range transportation plan for the Baltimore region prepared by the BRTB with support from the BMC. This federally mandated plan sets the transportation project priorities for the Baltimore region for which funding is expected to be available. The projects must be in conformance with the National Ambient Air Quality Standard. The Plan includes funding particularly for travel demand management and emission reducing strategies to improve air quality and is directed into three categories: technologies such as alternative fuels and hybrid vehicles, behavioral strategies such as alternate commuting options and clean commute marketing and capital improvements such as expansion of parking at MARC stations and structured parking.

Anne Arundel County supports the Federal, State and regional regulations and programs by adopting a land use pattern that has a positive influence on air quality. The following are types of development that are encouraged within the County through the Zoning Ordinance and help to curb adverse pollution effects:

1. Mixed-use development: locates complementary land uses such as residential, commercial and employment within walking distance of each other,
2. Transit-oriented development: encourages transit use by developing moderate to high-density residential uses, shopping and employment centers along the MARC system,
3. Infill development: encourages pedestrian and transit travel by locating new development in existing developed areas where activities are closer together, and
4. Town centers: encourages pedestrian and transit travel within these growth areas.

Other measures undertaken by the County to control air pollution are implementation of the County's Pedestrian and Bicycle Master Plan that promotes biking and walking, and the County's Transit Development Plan, which is a five-phase document identifying local bus transit needs and recommending services to meet those needs. In addition, Anne Arundel County is fortunate to have two transportation management associations, The Annapolis Regional Transportation Management Association and The BWI Business Partnership. These organizations advocate and promote transportation demand management strategies to reduce traffic congestion and air pollution, reduce commuting cost and provide a central information service for ridesharing and public transportation.

The Small Area Plans make recommendations that encourage local level plans and programs to improve air quality. Some of the recommendations include adopting land use and transportation plans that promote the use of public transit, HOV lanes, ridesharing and carpooling, developing programs through the Health Department to educate the public about ways individuals can help reduce ozone, banning the use of certain air polluting sources on bad air quality days, providing incentives for property owners to establish natural area buffers and tax breaks or other financial

incentives for mass transit operators to run on natural gas and exploring the feasibility of expanding public transit in the area.

IX. Noise Pollution

Noise at excessive levels affects our quality of life and the environment. It impacts the lives of many County residents, particularly noise that is generated from transportation sources such as highway traffic, railroads and aircraft operations as well as construction and industrial activities.

Point source noise pollution (such as stationary construction equipment) and non-point sources (such as vehicular traffic) are transferred through vegetative and non-vegetative features to a receiver. The method of noise transmittal determines the noise impacts that could vary based on elements such as terrain, highway alignment, and intervening structures within the noise transmission path.

Noise impacts can be severe and have significant effects on humans, including hearing loss. Considerable research has been conducted to determine the effects of various sound pressure levels on human health. In addition to existing noise attenuation measures, appropriate land use planning policies will protect people by minimizing the noise impacts.

Regulations and Programs

Many regulations and programs adopted by the State and Anne Arundel County currently assist in minimizing noise impacts. Maryland’s Environmental Noise Act of 1974 sets limitations on noise levels to that which will protect the general health, welfare and property of the State. It requires that MDE assume responsibility over the level of noise, establishing regulations for the control of noise, including for ambient noise levels and enforcing the standards and regulations. Effective July 1, 2005, MDE Noise Control Program was de-funded and by legislative action, noise issues are being referred to the local governments for action.

Environmental Noise Standards

The following table shows the maximum sound levels that represent the State standards by general land use category. Noise is measured in decibels and quantified by statistical descriptors, Leq (constant average sound level over a period of time) and Ldn (day-night average sound level for a 24-hour day).

**Table 3
Environmental Noise Standards**

Land Use Category	Level	Measure
Industrial	70 dBA	Leq
Commercial	64 dBA	Ldn
Residential	55 dBA	Ldn

State noise regulations set maximum day and night sound level limits for receiving land uses. The table below shows the maximum allowable noise levels for industrial, commercial and residential land uses.

Table 4
Maximum Allowable Noise Level (dBA) for Receiving Land Use Categories

	Industrial	Commercial	Residential
Day	75	67	65
Night	75	62	55

Highway Noise

The Maryland State Highway Administration Noise Policy provides for the evaluation of sound barriers for communities that are adversely impacted by noise from new and existing State maintained highways.

The Anne Arundel County Code (Article 17-3-505) addresses highway noise by regulating the minimum distance a residential dwelling can be from the edge of the mainline pavement of certain roads in the County. Figure 12 shows the roads in the County that have this buffer.

Airport Noise

The Environmental Noise Act of 1974 also required the Maryland Aviation Administration (MAA) to adopt an Airport Noise Zone (ANZ) and Noise Abatement Plan (NAP) at Baltimore-Washington International Thurgood Marshall Airport to minimize the impact of aircraft noise for those living near the airport and prevent incompatible land uses around the airport. See Figure 13 for the current ANZ delineation. The NAP recommends measures to monitor and reduce or eliminate impacted areas. In developing the NAP, the MAA works with an advisory committee composed of neighborhood representatives, airport officials, and local, State and Federal officials. The MAA is required to update the ANZ and the NAP every five years to account for changes in flight paths, total annual aircraft operations, and aircraft types.

In general, residential land uses around the Airport are considered incompatible in areas of 65 dBA or greater. There are some residences in these areas that existed prior to the Airport, but for the most part, land outside of the Airport is zoned for industrial uses. In addition, the MAA has an established voluntary land acquisition program to acquire properties severely impacted by aircraft noise and a Homeowners Assistance Program to provide financial assistance to property owners who are not eligible for the acquisition program. There are two types of financial assistance, a sound insulation program and a resale assurance program. Under the sound insulation program, existing houses are modified to make aircraft noise less intrusive. The resale assurance program assists homeowners who wish to move out of the Noise Zone by guaranteeing that they will receive fair resale value for their homes.

Railroad Noise

The Federal Railroad Administration (FRA) relies upon the Federal Transit Administration noise and vibration impact assessment procedures for assessing improvements to conventional passenger rail lines and stationary rail facilities and horn noise assessment. Train noise can often be controlled through modifications to the trains or tracks or through construction of low noise barriers or berms. FRA's Office of Safety is responsible for enforcing the Railroad Noise Emissions Compliance Regulation that sets maximum sound levels from railroad equipment and for regulating locomotive horns.

Current County Goals and Strategies for Reducing Noise Impacts

The 1997 General Development Plan established a goal to promote innovative techniques to reduce impacts from noise. To help achieve this goal, the County Code was revised to include noise reduction standards that are linked to decibel levels for specific uses. A few of the Small Areas, primarily those located near the Airport and the CSX Railway, identified noise pollution as a problem and made recommendations in the Small Area Plans for addressing the problems such as encouraging the construction of sound sheds, continuing use of sound barriers, expanding and enhancing the residential noise proofing program around the Airport, raising higher protective standards in the County Code, and finding solutions for noise problems generated from the CSX railroad.

X. Mineral Resources

The underlying geology of Anne Arundel County contains large quantities of unconsolidated sedimentary materials that are available for productive extraction and processing via surface mining operations. Surface mining operations within Anne Arundel County concentrate on the extraction of sand and gravel. Sand is used in the construction of roads and highways, while both sand and gravel are key ingredients used to manufacture concrete. Additionally, there are mining operations that extract loose soils from what have come to be known as ‘borrow pits’. Loose materials extracted from borrow pits are used in landscape service operations, as supplemental fill for highway projects, as well as for certain building construction projects.

Mineral resources represent a valuable commodity for the local and regional economies. Recent data from the United States Geologic Survey (USGS) shows that sand and gravel production topped \$96 million Statewide in 2006, with the total quantity of sand and gravel sold or used reaching 11.9 million metric tons. Approximately 61% of the sand and gravel produced and sold across the State was in the form of concrete aggregate (which includes concrete sand). Operationally, sand and gravel mining produced 18 million tons of material at an estimated value of 78 million dollars (or \$4.3 million net value per ton produced) in 2006.

The first comprehensive mining legislation was passed by Congress in the late 1970’s. In 1977, the Surface Mining Control and Reclamation Act of 1977 (SMCRA) was passed to regulate surface and subsurface mining as well as reclamation activities. The intent of SMCRA was to provide a balance for meeting the energy and resource demands of the Country in an environmentally sensitive manner. This law forms the basis from which States and local jurisdictions govern these mining activities. Code of Maryland Regulations (COMAR), Title 26; Subtitle 21 represents the States legislative authority for regulating surface mining activities. Adopted in 1977, the authority for Title 26 was granted under Maryland Environmental Article 15-803, and 15-813 for non-coal mining permits.

COMAR Title 26 regulates non-coal surface mining activities and operations. The State mandates that surface mining license applications contain detailed information, including grading and sediment control information. COMAR also requires applicants to submit back filling, grading, and re-vegetation (reforestation), as well as detailed reclamation plans once the productive life of the operation has been reached. Aside from regulating the physical operation and immediate environmental oversight of the mine, Title 26 also governs minimum distances

that certain mining activities must maintain from other surrounding properties and non-commercial/industrial uses.

Anne Arundel County has continued to support the State in preserving surface mining operations, while at the same time ensuring that the extraction of mineral resources are done in an environmentally sensitive manner. According to COMAR, the local permitting authority must uphold the intent of Title 26 by way of proper environmental and residential protections while simultaneously allowing the mining operations to be a productive contributor to the local economic base. Anne Arundel County’s primary means of regulating and permitting surface mining operations is through Article 18 (Zoning) of the County Code. These zoning regulations apply locally the intent of Federal and State law (*SMCRA and COMAR respectively*). Under Article 18, activities associated with the surface mining industry are separated into several distinct uses as shown in Table 5. Clay and borrow pits, or sand and gravel operations are categorized differently than *manufacturing* of clay, sand, or gravel.

Table 5
Permitted Surface Mining Activity by Zoning Category, Anne Arundel County

Use / Description	RA	W2	W3
Clay / Borrow, Sand & Gravel Pits	Special Exception	Special Exception	Special Exception
Clay Manufacturing Facility	N/A	N/A	Permitted
Processing Facility for Clay, Sand & Gravel	Conditional	Conditional	Conditional

Clay and ‘borrow’ pits or sand and gravel pits are uses allowed by special exceptions in RA, W2, and W3 zones, while manufacturing of clay is a permitted use within the W3 zone only. Processing facilities for clay, sand and gravel is yet another distinct use within surface mining operations. Clay, sand or gravel processing is allowed as a conditional use in RA, W2, and W3 zones. However, a processing plant can be part of the actual extraction site, which requires special exception approval.

Existing Mining and Reclamation Sites

Surface mines continue to represent a viable component of the County’s industrial sector. During the 1997 GDP update, 25 active surface mining operations were documented Countywide. While many of the mining operations continue to be productive, several active mining operations are beginning to reach the end of their lifecycle. Upon examination of surface mining operations licensed by the Maryland Department of Environment (MDE), the number of active mining operations has decreased from 25 to 17 since the 1997 GDP update. As was the case during the 1997 GDP update, the majority of these operations lie along the Patuxent River shoreline in the western and southwestern portions of the County (See Figure 14).

The surface mines shown in Figure 14 have active State licenses. There are periods of time when the operational status may be in transition because the reclamation process involves the conversion of a once active mining extraction site for productive re-use. According to COMAR (Section 16.21.01.16, Reclamation Schedule), MDE requires all surface mining applications to include a reclamation plan and expected timeline for terminating mineral extraction activities.

MDE requires that a licensed operator begin reclamation of the site as soon as feasible once mining operations begins, continuing concurrently with mineral extraction and, upon termination of mining, until the entire permit area is reclaimed. In some instances, a mining operator may not be able to begin reclamation until after mineral extraction is completed. While the State gives a two-year timeframe for completing reclamation, an operator may request that the reclamation time period be extended beyond the two-year post extraction period.

To date, out of the 17 active operations Countywide, 5 operators are exclusively involved in mineral extraction. Four are in the process of reclaiming their site while maintaining mineral extraction activities, 7 have finished extraction and are within the reclamation phase, and 1 license has completed reclamation and is awaiting bond release from the State (See Table 6).

Table 6
Anne Arundel County Active Surface Mining Licenses

License	Status	Company Name
77-SP-0070-3	Active Mining and Reclamation	Belle Grove Corporation
77-SP-0074-D	Active Mining and Reclamation	Belle Grove Corporation
77-SP-0096-G	Active Mining Only	BBSS, Inc.
77-SP-0137-3	Active Mining Only	Branford, LLC
77-SP-0141-D	Active Mining Only	Moreland, Robert S.
78-SP-0018-3	Active Mining Only	Brandywine Sand & Gravel Company
78-SP-0087-G	Active Mining Only	Cunningham Sand & Gravel, Inc.
80-SP-0838-E	No Mining - Final Reclamation	Campbell Sand & Gravel Co. Ltd
82-SP-0130-1	No Mining - Final Reclamation	Belle Grove Corporation
84-SP-0180-D	No Mining - Final Reclamation	Laurel Sand & Gravel, Inc.
85-SP-0205-B	No Mining - Final Reclamation	JIH Enterprises Corp.
86-SP-0231-1	No Mining - Final Reclamation	Classic Community Development Corporation
88-SP-0288-3	No Mining - Final Reclamation	Tierras, LLC
89-SP-0335-B	Reclaimed - No Bond Release	Chaney Enterprises Ltd Partnership
91-SP-0394-D	Active Mining and Reclamation	Chaney Enterprises Ltd Partnership
94-SP-0468-D	Active Mining and Reclamation	BBSS, Inc.
97-SP-0517-1	No Mining - Final Reclamation	Harwood Landfill, Inc.

Source: MDE Minerals, Oil And Gas Division (01/30/08)

Land Use Policies and Reclamation of Surface Mining Sites

During the 1997 General Development Plan Update, Anne Arundel County developed several policies and actions aimed at promoting the overarching mineral resources goal of '*prudent use of mineral resources for economic use while maintaining the quality of life of surrounding residents*'. The primary policy statements in the GDP were to conserve mineral resources for future extraction, and to protect natural resources before, during, and after the extraction of minerals. The County GDP specifically recommends the implementation of buffers in order to keep nearby residents protected from certain mining activities.

In addition, SAPs specific to those areas bordering the Patuxent River recommended developing a Patuxent River Greenway Overlay District that would include, among other things, guidelines or criteria related to sand and gravel mining sites, and also recommended support of the Patuxent River Policy Plan. Originally adopted by the Maryland Department of Planning in 1984, the Patuxent River Policy Plan is a statewide land management policy document aimed at preserving and enhancing the environmental quality of the Patuxent River and its watershed. It makes reference to protecting and managing lands such as agriculture, forests, and aquifer recharge zones, as well as potential sand and gravel extraction sites. The Plan clearly indicates the need to identify where future sand and gravel extraction operations may be located. The 1997 GDP identified mineral resource areas based on geological conditions, but mining in all of these areas would not be consistent with current land use plans and zoning.

There are several examples where active mining sites have been successfully reclaimed through various public and private partnerships. Many of these successes are for sites along the Patuxent River. One of the most recognized examples of successful reclamation in Anne Arundel County is the former 'Mardis Pit' operated by Chaney Enterprises. This former mining site was converted to a private golf course, The Renditions golf course, and was awarded the 2004 Reclamation Award by MDE as well as the 2004 National Reclamation Award by the Interstate Mining Compact Commission (IMCC) for the 'non-coal' category. Other examples include a site once operated by the Genstar Stone Products Company, as well as a site formerly operated by Brandywine Enterprises, Inc. The Genstar Stone Products site is now used for multi-purpose athletic and recreation fields, along with some trails/walking paths that surround the fields. Anne Arundel County purchased the site in 2000. The Brandywine site is now under passive recreation / environmental preservation.

All of the reclaimed mining sites are located in South County. The planning goals and objectives of the South County Small Area Plan, as well as the Patuxent River Policy Plan, are being implemented in part via the successful reclamation of these sites to recreational or passive open space uses.

While not common, there are also some active mining licenses located in areas of the County that are currently planned for residential or industrial use. Examples are the Belle Grove Corporation site in Brooklyn Park that is planned for residential use on the County's Land Use Plan, and the Laurel Sand and Gravel site in Annapolis Junction that is planned for Industrial use. Sites such as these serve as important redevelopment opportunities for the County once the reclamation process has been completed.

MDE tracks the operational status of a mining operation and continues to classify a licensed facility as 'active' until all local approvals are met. The State provides mining operators between 3 to 5 years after a mining license expires to complete reclamation actions, and requests and receives the released liability bond. However, a license can remain active while redevelopment plans are submitted through a separate process. This underscores the utility of having access to a current surface mines record, especially the reclamation status for each operation. Access to information such as this is particularly useful for ensuring proper compliance with local land use policies, and allows ready assessment for redevelopment and reuse potential.

XI. Conclusions and Future Needs

Comprehensive plans such as the General Development Plan, the 16 Small Area Plans, the Greenways Master Plan, and the Land Preservation, Parks and Recreation Plan have provided a good framework for natural resource land conservation in the County. The integration of the comprehensive plans and the regulations, programs and other tools such as the Forest Conservation Program, the Critical Area Program, the Subdivision, Zoning and Floodplain Ordinances, the comprehensive Watershed Assessment and Planning documentation, and the Watershed Management Tool has led to significant progress in implementation of the goals. To have a more complete, contiguous network of land that is protected, items to be addressed in the 2008 *General Development Plan* (GDP) should include:

1. Implementation of the existing recommendations within the comprehensive plans, which are critical to natural resource conservation efforts such as the continued development of watershed management plans, participation in the tributary strategies teams, stream reach restoration and riparian buffer rehabilitation,
2. Consolidation of the natural resource goals, policies and recommendations that have been adopted since the 1997 *General Development Plan* (GDP), and
3. Continued and enhanced coordination between the existing and proposed programs.

Watershed Assessment and Protection

Watershed protection is currently accomplished through a number of individual programs including watershed management plans, the erosion and sediment control program, the stormwater management program, stormwater NPDES permit, and the Critical Area program. Future needs related to these programs that are proposed for consideration in the 2008 GDP include:

1. Continued progress toward completing watershed management plans for the entire County, including a program for plan recommendation implementation,
2. Stricter stream buffer requirements and implementation of environmentally sensitive site design criteria for development and redevelopment,
3. Development of environmental zoning overlay zones, including the Jabez Branch Overlay Zone,
4. Continued encouragement of no net loss of wetlands and development of programs for wetland creation and enhancement,

5. Development of a method of identifying and tracking protected lands throughout the County, including those protected through private means (e.g., private land trust easements),
6. FEMA's Community Rating System, and
7. Review and update of steep slopes criteria within the County to better protect and preserve this sensitive resource.

Greenways, Open Space and Forest Resource Conservation

The Greenways Master Plan and the Land Preservation, Parks and Recreation Plan have established strategies and actions for protection of the greenways network. Consolidation of these strategies and actions in the updated GDP as well as better linkage between the programs will help facilitate implementation. Additional recommendations for consideration may include:

1. Updating and refining the greenways layer using the new parcel database,
2. Creating a property specific database for tracking and outreach purposes,
3. Establishing a permanent and ongoing system for tracking the properties in the network,
4. Developing a priority ranking system for targeting funds,
5. Establishing a proactive outreach program to "market" the Greenways Plan, and
6. Establishing a comprehensive approach to woodland conservation.

Improving Air Quality

Considerable progress has been made in improving air quality within the last two decades due to regulations, programs and plans that have been established. However, there are still significant air quality issues that need to be addressed to ensure that success continues. These issues can be addressed by development of new policies and actions to continue the success. Consideration should be given to policies that would:

1. Promote the development and use of alternative modes of transportation;
2. Promote efficiency in providing urban services, reduction in automobile use via composition and intensity of land uses, location criteria, and the timing of development;
3. Market mixed-use developments or transit-oriented development through monetary incentives and non-monetary incentives (reduced parking requirements, accelerated permit processing, etc.);
4. Discourage automobile use and encourage alternative transportation modes; improve the efficiency of vehicular travel by promoting: High occupancy vehicle (HOV) lanes, flexible work hours and schedules, telecommuting and parking controls;
5. Discourage incompatible land uses that would have localized affects on pollution by locating "sensitive land uses" such as schools, daycare centers, parks, playgrounds, nursing homes, hospitals and residential communities at an appropriate distance from specific sources of pollution such as freeways, distribution centers, rail yards, ports, refineries and dry cleaners. Also discourage cumulative impacts of concentrating multiple sources in an area.
6. Promote public education of air pollution such as providing air quality data and methods to improve air quality on Anne Arundel County's website and encouraging all public schools in the County to integrate air quality improvement into the curriculum.

Reducing Noise Impacts

There are some regulations in place that help minimize noise impacts however, since the authority to act on noise issues has been given to local jurisdictions by the State, it is the County's responsibility to address areas where noise is an issue. Policies and actions will need to be identified in the updated GDP that will help improve the compatibility between land uses while serving to reduce noise impacts. An assessment of current regulations will need to be considered, as well as an evaluation of residentially zoned land around the airport. Also, the current requirements for highway buffers should be reviewed as well as consideration given to buffers being provided on other roads and railroads.

Mineral Resources

Surface mining operations within Anne Arundel County continue to support the local and regional economy. For those mining operations near the end of their active mineral extraction, State and County planners should cooperate to ensure that site reclamation complies with long term land use planning. This is critical for reclamation sites within planned growth boundaries as these areas have a greater chance for experiencing long-term land use changes. The County should establish and maintain points of contact between Planning and Zoning and MDE to ensure accuracy and reliability of licensed surface mining operation sites. Designated staff should periodically update and evaluate existing mining operations and current reclamation plans status for compliance with locally adopted land use plans.

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